ALBERTA OIL SANDS INDUSTRY

QUARTERLY UPDATE

SPRING 2018

Reporting period:
DEC. 8, 2017
TO MAR. 15, 2018

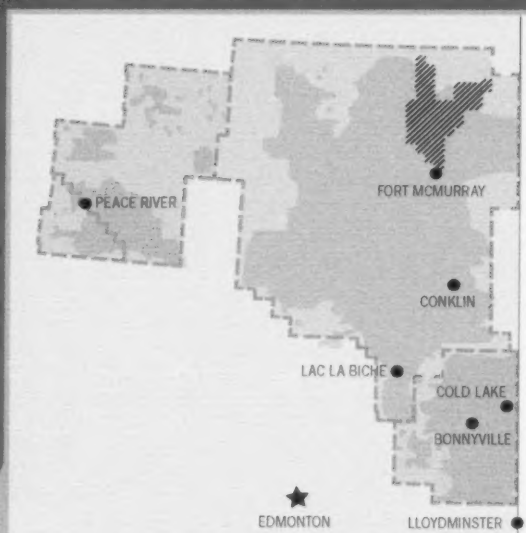
2 Oil sands map
3 Market update
6 Resource + technology spotlight

What's new
7 Projects
8 Business
9 Environment + technology

10 Oil sands data
13 Glossary
15 Contacts

ALBERTA'S OIL SANDS

Canada's oil sands resources exist in three major deposits in Alberta: Athabasca, Cold Lake and Peace River. Athabasca, the largest in size and resource, is home to the surface mineable region. All other bitumen must be produced in situ or by drilling. Currently, the vast majority of oil sands production is exported to U.S. markets.



Initial volume in place
1.84 trillion barrels

Initial established reserves
176.8 billion barrels

Remaining established reserves (2016)
165.4 billion barrels

Cumulative production (2016)
11.4 billion barrels

Kitimat
Peace River
Fort McMurray
Grande Prairie
Edmonton
Burnaby
Hardisty
Anacortes
Calgary
Cromer
Clearbrook
Superior
Quebec City
Saint John
Montreal
Guernsey
Sarnia
Flanagan
Chicago
Patoka
Wood River
Cushing
Houston
Port Arthur
Freeport

Oil sands deposit
Peace River
Athabasca
Cold Lake
Surface mineable area
Oil sands area
Capital of Alberta
Pipeline
Proposed Pipeline

Canadian and U.S. crude oil pipelines and proposals

1. Enbridge Gateway
2. Kinder Morgan Trans Mountain
3. TransCanada Keystone
4. Spectra Express - Platte System
5. TransCanada Keystone XL
6. ENB Spearhead South
   ENB Flanagan South
7. ENB/Enterprise Seaway
8. TransCanada Gulf Coast Extension
9. Enbridge Mainline
10. TransCanada Energy East
11. Enbridge Line 9
12. Enbridge Southern Access

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MARKET UPDATE

OIL SANDS ECONOMICS NO LONGER WHAT IS HOLDING BACK GROWTH: WOOD MAC

Oil sands projects aren't as high cost as they used to be, but investors still aren't ready to inject cash into another wave of growth.

That's because the improvements that have been made on the cost front are being obscured by other factors, according to Wood Mackenzie.

Non-energy in situ operating costs have dropped 45 per cent since the first quarter of 2014, with leading projects below C$5/bbl, notes Mark Oberstoetter, Wood Mackenzie's director of Canada upstream research.

He adds that at the same time, integrated mining opex has fallen 33 per cent, with Canadian Natural Resources' Horizon project achieving less than $20/bbl in the fourth quarter of 2017.

Capital cost reductions have not yet replicated the success that has been realized in operating costs on the whole, with a technological step change required to bring the breakeven for a new SAGD project under US$50/bbl, Wood Mackenzie says, but there are recent examples coming closer to US$54/bbl.

"We're seeing phase-level break evens in the high $50s for a [Pengrowth] Lindbergh Phase 2 or some of those kind of good, low hanging fruit projects, and that's going to compete with your Tier 2s in the Eagle Ford. It's already competing with some of the Bakken well level economics, but it's a very different decision than an incremental well in the Bakken," he says.

"You still have that dynamic of short-cycle returns, which are in vogue now, versus these long-life projects where you'd need a little bit more confidence on a $60 or higher oil price. But in terms of the economics, we think they compete... you're not going to compete with the best of the best of the Permian, but those get drilled up eventually."

Construction on some new oil sands projects was restarted over the last year, but Oberstoetter says this is not surprising given the large amount of sunk capital in half-built facilities. In recent months however, new work has gotten the green light, including Osum's Phase 2B at Orion and MEG Energy's brownfield expansion at Christina Lake.

"If we're expanding that out to the bigger projects, the Pengrowths and Cenovuses and CNRLs, they're worried about what that investor backlash would be on a [final investment decision]. Their investors need to be sold that the oil sands cost structure has come down."

Pipeline export capacity in particular is a key issue that is masking progress being made on costs, Wood Mackenzie said in a research note earlier this month.

"Market access is a logical one that they would question. Why would you add until you get some certainty on some of these pipelines?" Oberstoetter asks.

The next wave of oil sands project development is likely to occur in the mid-2020s, he says, around the time that the U.S. Lower 48 supply juggernaut is expected to plateau. Even though this is the same timeframe for an anticipated plateau in demand, new projects will still be required – including in the oil sands.

"Even if we are in a declining oil demand environment, you still have to replace a lot of the lost production per year. That gives us confidence that U.S. tight oil is not enough; you need deep water, you need oil sands, and you need a price higher in the $60s, $70s to support those [final investment decisions]," he says.

That includes proposed projects like Imperial Aspen, Cenovus Narrows Lake and Foster Creek Phase H, as well as Suncor Energy Meadow Creek and Lewis.

"They're in a time frame that probably makes more sense for more aggressive oil sands expansion; the companies that are pushing those forward, pretty soon they're going to run out of opportunities to acquire things, and if they do want growth in that time frame, it will mean going back to a modular SAGD growth." ■

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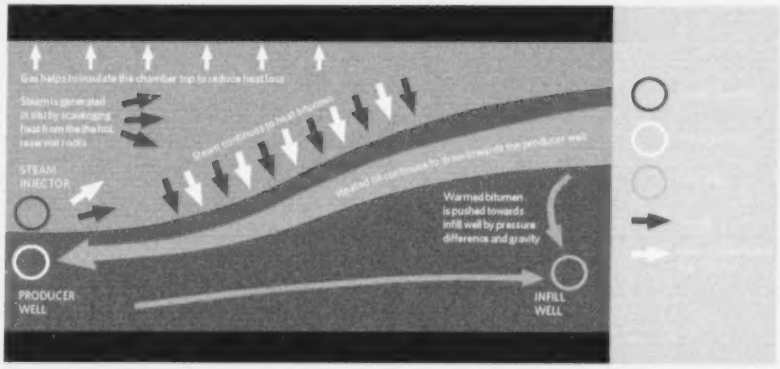
RESOURCE + TECHNOLOGY SPOTLIGHT

NON-CONDENSABLE GAS CO-INJECTION


Gas helps to insulate the chamber top to reduce heat loss
Steam is generated in situ by scavenging heat from the hot reservoir rocks
Steam continues to heat subcool
STEAM INJECTOR
Heated oil continues to drain towards the producer well
Warmed bitumen is pushed towards infill well by pressure difference and gravity
PRODUCER WELL
INFILL WELL

BACKGROUND

SAGD technology, which was commercialized in 2001, has been a spectacularly successful oil sands recovery process, with output roaring to approximately 1.2 million barrels per day today.

However, it remains an energy intensive process, which is why producers remain committed to lowering the steam/oil ratio.

One way of doing this is to add small amounts of non-condensable gas (NCG) such as methane to steam injected into the reservoir after wells have been producing over a period on SAGD mode.

Once there is sufficient heat in the reservoir, the NCG helps maintain pressure and frees up steam to be redeployed into new SAGD well pairs.

MEG Energy has realized great success with NCG co-injection and is currently in the process of deploying it across its oil sands project site. Other companies are in the process of following suit.

HOW IT WORKS

Dr. Roger Butler, the inventor of the SAGD process, also developed a system he called steam and gas push (SAGP). This involves co-injecting relatively small amounts of a NCG with steam.

The gas has several benefits. It replaces some of the steam, resulting in a lower steam/oil ratio. It helps maintain pressure. (As steam condenses, pressure drops in the reservoir. But methane doesn't condense, so the pressure needed to push the heated bitumen to producer wells is maintained.)

The gas also forms an insulating blanket that reduces heat loss into the cap rock, thereby improving energy efficiency. The methane layer at the top of the steam chamber also forces the steam to flow laterally. So instead of reaching the overburden -- where heat is wasted -- steam is diverted laterally where it continues to mobilize bitumen.

SAGP was first piloted at the Dover test site where SAGD was developed. That government-funded testing, and several more recent pilots by oil sands producers, indicated SAGP could improve steam/oil ratios without reducing oil production.

MEG's take on the system is called enhanced modified steam and gas push (eMSAGP), which also includes drilling of single collector wells between well pairs to collect bitumen that would otherwise be unrecoverable.

The technology has enabled MEG to increase production without increasing steam generation capacity. In those specific well patterns where eMSAGP has already been deployed, the company is currently seeing a steam-oil ratio of approximately 1.3:1 (the industry average is 3:1), with the freed-up steam being diverted into new wells to further increase production.

WHERE IT WORKS/ CURRENT STATUS

MEG will complete the implementation of the eMSAGP growth initiative across its Christina Lake project in 2018, which is expected to enable production to continue to ramp up to reach 95,000 to 100,000 barrels per day by the end of the year.

In early 2017 Suncor Energy received regulatory approval to convert all steam injectors on one pad at its Firebag project to NCG co-injection.

In summer 2017, Canadian Natural Resources Limited applied to implement NCG co-injection on one well pad at its Kirby South SAGD project. The application was approved in November 2017.

Also in November, ConocoPhillips Canada filed an application for broad use of NCG co-injection at its Surmont SAGD project, following successful pilot testing. It received regulatory approval in January 2018.

ConocoPhillips began injecting non-condensable gas with steam at three Surmont well pairs in December 2016 and has extended co-injection to all the well pairs on one pad. ConocoPhillips's regulatory application sought approval for NCG co-injection at four drainage areas at Surmont Phase 1 and 11 drainage areas at Surmont Phase 2.

In September 2017, junior BlackPearl Resources Inc. also applied for an NCG co-injection trial at its Blackrod SAGD pilot. This was approved in October. ■

WHAT'S NEW
PROJECTS

Suncor Energy continues to advance its oil sands growth strategy post 2020, filing in March 2018 the regulatory application for the 160,000 bbl/d Lewis SAGD project. Lewis, which would be built in four "replication" phases, is slated to come online after the company's initial phases at Meadow Creek East and Meadow Creek West, with first oil planned for 2027.

Suncor has identified 10 in situ oil sands project locations to add approximately 360,000 bbls/d going forward, CEO Steve Williams said last year. The first is expected to be 40,000 bbls/d at Meadow Creek East in 2023.

Suncor received regulatory approval for Meadow Creek East in March 2017 and filed its application for Meadow Creek West last October.

Suncor Energy announced official start-up of its brand-new Fort Hills oil sands mine in late January. So far the project has produced 1.4 million barrels of bitumen froth, the company said. Production from the first of three trains from secondary extraction was expected to ramp up through the first quarter, followed by start up of the second and third trains in the first half of 2018.

Suncor sai d Fort Hills is on track to reach 90 percent of its 194,000 bbl/d capacity by the end of 2018.

Imperial Oil says that production at the Kearl oil sands mine in 2020 will be about 60,000 bbls/d higher than it was in 2017.

This will be the result of "improvement activities" conducted last year as well as a new project that will run through 2018 and 2019.

Kearl averaged 178,000 bbls/d for the full year 2017 against capacity of 220,000 bbls/d. This compares to 169,000 bbls/d in 2016.

Imperial plans to reach 200,000 bbls/d this year and then 240,000 bbls/d in 2020 after investing in supplemental crushing capacity and flow distribution interconnects to enhance reliability, increase redundancy and reduce downtime, the company said. Its share of the project will be $400 million, indicating that the full cost will be approximately $563 million including ExxonMobil's 29 per cent ownership investment.

Privately held junior Osum Oil Sands Corpsays it will proceed with work at the Orion SAGD project to increase production capacity, planning to double its volumes by the end of 2019.

Orion, which Osum purchased from Shell in 2014 for $325 million, currently produces about 9,000 bbls/d and is the company's sole operating asset. It is located near Cold Lake, Alta.

In fall 2017, one month after completing its 1,500-bbl/d Phase 2A expansion, Osum commenced construction of Phase 2B, which will add 3,000 bbls/d of capacity with first steam expected in mid-2018. Today the company sanctioned Phase 2C, which will add a further 6,000 bbls/d of capacity by the end of 2018.

"We are on a clear path to double production by the end of 2019, moving us closer to our goal of producing 20,000 bbls/d at Orion," Osum CEO Steve Spence said in a statement.

He told JWN that the company is benefiting from a "continuum of execution" with workers and equipment already in the field.

"We announced our Phase 2B expansion back in October, which started the ball rolling for us. We've got a rig in the field, construction work ongoing; we knew we wanted to proceed with Phase 2C in a timely manner following up on that. As we looked at the opportunities to jointly execute the projects it just made an awful lot of sense to do them together. We will be working with essentially the same contractors and just continuing the program along rather than taking a break in between, so the synergies of doing that were pretty strong," Spence said.

While the capital cost of the latest expansion was not disclosed, Osum said it would be funded by cash on hand and cash flow. ■

WHAT'S NEW
BUSINESS

Suncor Energy has increased its share in Fort Hills to 53.06 per cent from 50.8 per cent, while Teck has increased its ownership stake to 20.89 per cent from 20.0 per cent. Total has in turn decreased its ownership share to 26.05 per cent from 29.2 per cent.

Under the new agreement, Suncor and Teck have funded an increased share of the project capital, in the amounts of approximately $300 million and $120 million respectively, which Suncor said may be further adjusted in accordance with the terms of the deal.

Horizon North Logistics has entered into new partnerships with the Chipewyan Prairie Dene First Nation south of Fort McMurray and the Athabasca Chipewyan First Nation north of Fort McMurray, as well as the $14-million acquisition of the Moose Haven Lodge from the Chipewyan Prairie band.

Moose Haven Lodge is located near Janvier, in the heart of what has been called "SAGD central," with multiple large-scale projects operated by companies including Cenovus Energy, MEG Energy, Devon and ConocoPhillips.

While the lodge may be the primary asset in the deal announcement, the partnerships are of greater importance, said analysts with GMP FirstEnergy.

"We believe the value of this acquisition will be realized through additional catering contract wins for oil sands projects in the South Fort McMurray region. It is our understanding that the Chipewyan Prairie is uniquely positioned to win these contracts and Horizon North is their sole partner," wrote analyst Ian Gillies in a research note, adding that the benefit of First Nations partnering also exists in the mining region north of the city.

"Our understanding is that strong relationships with First Nations are now of paramount importance for securing accommodations contracts in the north of Fort McMurray oil sands area."

A report from IHS Markit's Oil Sands Dialogue is forecasting that oil sands capital spending will drop below $10 billion this year – the first time that has happened since 2004.

There is also no return to previous annual spending highs of over $30 billion in any of IHS Markit's three outlook scenarios.

"Each year since 2014, investment in the oil sands has fallen as projects have been completed and brought online and few new projects have been sanctioned," IHS Markit said.

Suncor Energy Inc. has reached an agreement to acquire Mocal Energy's five per cent interest in the Syncrude joint venture for US$730 million, or approximately C$920 million.

Through this transaction Suncor's share in the Syncrude joint venture will increase from 53.74 per cent to 58.74 per cent. Subsequent to the successful close of this transaction, the joint venture partners will be Suncor (58.74 per cent), Imperial Oil Resources (25 per cent), Sinopec Oil Sands Partnership (9.03 per cent) and Nexen Oil Sands Partnership (7.23 per cent).

MEG Energy Corp. has announced an agreement with Wolf Midstream Inc. for the sale of the company's 50 per cent interest in the Access Pipeline and 100 per cent interest in the Stonefell Terminal for cash and other consideration of $1.61 billion.

Wolf Midstream nearly two years ago bought out Devon Energy Corporation's 50 per cent interest in Access. MEG had been looking to unload its 50 per cent interest as well for some time.

Athabasca Oil Corporation is "exploring monetization options" for its thermal oil infrastructure. This includes a 300,000-barrel tank farm at Cheecham, south of Fort McMurray, and dilbit and diluent pipelines between the Leismer project and Cheecham Terminal.

Athabasca acquired the assets as part of its purchase of the Leismer oil sands project from Norway's Statoil in January 2017. The company says the tank farm and pipelines will "remain a strategic asset for future growth initiatives" at Leismer and at the proposed Corner project, which has regulatory approval. ■

WHAT'S NEW

ENVIRONMENT + TECHNOLOGY

The Alberta government says it will support up to $1 billion to help commercialize bitumen partial upgrading technologies.

The funding will occur over eight years beginning in 2019-20, and will include a variety of fiscal tools including loan guarantees and grants.

This will leverage construction of two to five partial upgrading facilities representing up to $5 billion in private investment, 4,000 jobs during construction and 200 full-time jobs during operation, according to the province.

The province says that partial upgrading would enhance oil sands industry competitiveness by reducing industry costs, increasing pipeline capacity and enabling more refineries to process Alberta bitumen products. It would not limit future opportunities for full refining within Alberta.

Canadian Natural Resources says it is on a pathway to produce oil sands with GHG emissions intensity that rivals that of light crude oil in North America and around the world.

A 2014 study by IHS Markit found that oil sands crudes consumed in the U.S. had GHG emissions that ranged from 1 per cent higher to 19 per cent higher than the average.

Canadian Natural, which produces from the Primrose, Kirby, Horizon and AOSP oil sands projects, doesn't just want to be equivalent to the average crude on GHGs, says executive vice-chairman Steve Laut – it plans to do better.

"If you look at where we are today at Horizon itself, taking our carbon capture and storage activities, we're about five per cent off the global average GHG emissions intensity for all crude oil," Laut told JWN.

"We see many improvements in the use of technology to leverage that. We're running pilots, [and] depending on the success of those pilots and the iterations we take we see a pathway where we could actually be below the global average oil greenhouse gas emissions intensity."

Suncor Energy says it will start replacing what appears to be its full heavy hauling mining fleet with driverless trucks.

Suncor, which has been running a field pilot of autonomous haulage systems since 2015, says it as validated that the technology can be used safely, effectively and efficiently in its operating environment.

The company announced that it will proceed with phased implementation over the next six years, starting with its North Steepbank Mine. The company said it expects to deploy more than 150 autonomous haul trucks in the full program, which it estimates to be one of the largest investments in electric autonomous vehicles in the world.

Suncor said it will "continue to work with the union on strategies to minimize workforce impacts," and that "current plans show that the earliest the company would see a decrease in heavy equipment operator positions at Base Plant operations is 2019."

The Northern Alberta Institute of Technology (NAIT) will receive almost $600,000 from Western Economic Diversification Canada and $200,000 from Canada's Oil Sands Innovation Alliance (COSIA) to develop "a new generation" of technology for oil sands water treatment.

The Membrane Technology Assessment Program will be built at NAIT's Centre for Oil Sands Sustainability to help develop 12 industrial water technologies used in oil sands, and train and develop 12 highly qualified people, NAIT said in a statement.

This will also enable at least six western Canadian oil companies the opportunity to test their technologies and more quickly implement innovations that create environmental and economic benefits, NAIT said.

Syncrude is one of nine operations in Canada that was recently recognized with one of the Mining Association of Canada (MAC)'s Towards Sustainable Mining leadership awards.

It's a program that has been underway for 13 years that focuses on environmental performance and social impacts.

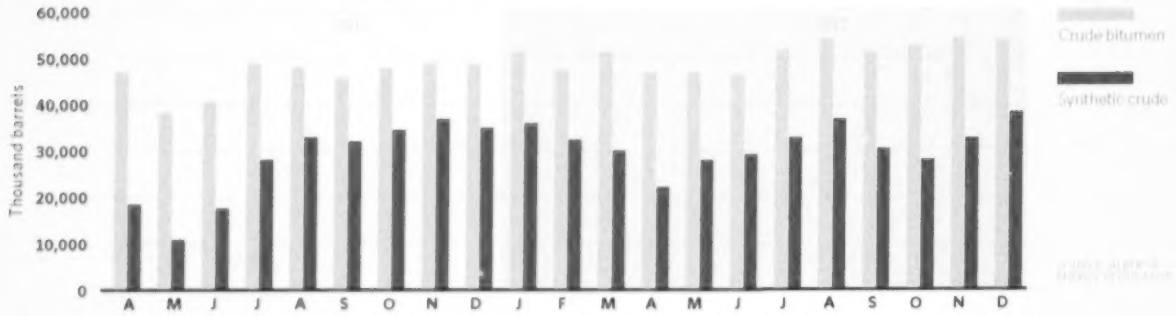
To win a leadership award, a facility undergoes an external verification in addition to its own annual self-assessments.

Syncrude reports that it was assessed on six indicators: aboriginal and community outreach, biodiversity conservation management, energy use and GHG emissions management, safety and health, tailings management, and crisis management and communications planning.

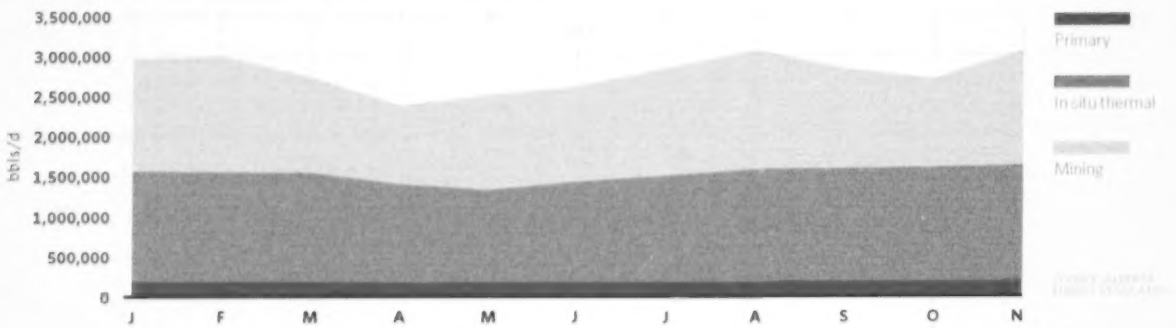
The awards are an "important and rare distinction," according to MAC president and CEO Pierre Gratton. ■

OIL SANDS DATA

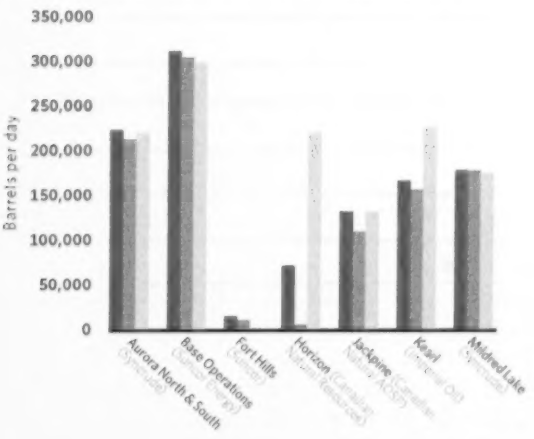
ALBERTA CRUDE BITUMEN AND SYNTHETIC CRUDE PRODUCTION



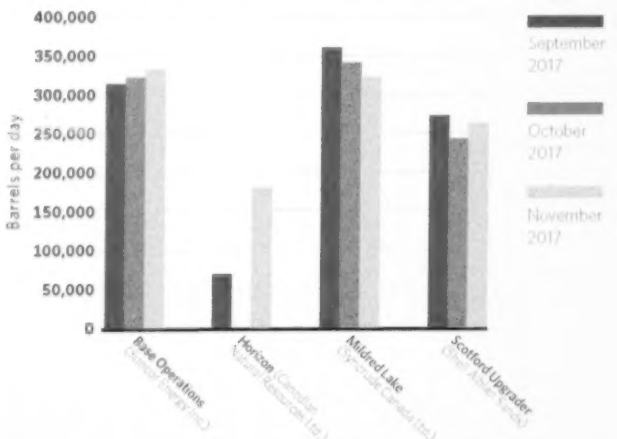
ALBERTA BITUMEN PRODUCTION BY EXTRACTION TYPE



OIL SANDS MINING PRODUCTION BY PROJECT



OIL SANDS UPGRADER PRODUCTION BY PROJECT



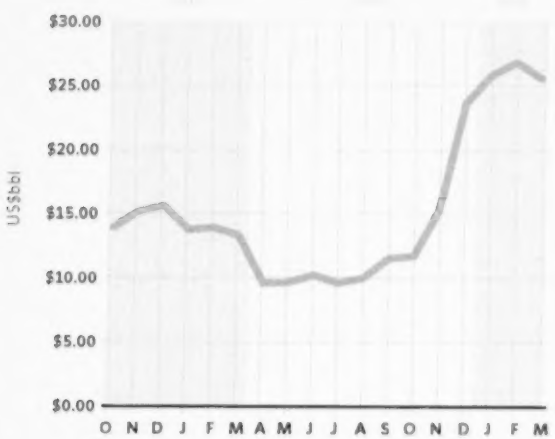
THERMAL OIL SANDS PRODUCTION BY PROJECT
OCTOBER 2017 - DECEMBER 2017

(Barrels per day)

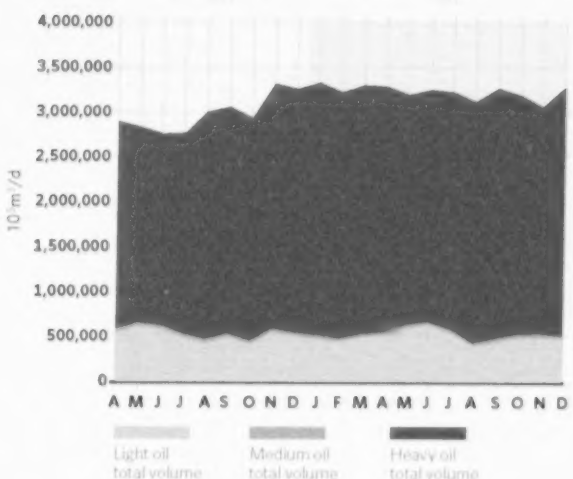
PROJECT	OCT	NOV	DEC	MONTHLY AVERAGE
Firebag	211,351.50	204,060.30	209,640.70	208,350.83
Christina Lake	200,248.70	206,844.20	212,518.90	206,537.27
Cold Lake	165,374.80	170,046.90	169,731.80	168,384.50
Foster Creek	158,166.70	152,638.00	152,663.80	154,489.50
Surmont	136,412.80	137,921.70	139,789.20	138,041.23
Jackfish	125,191.80	120,644.90	117,110.00	120,982.23
Christina Lake	82,775.20	86,453.40	90,836.20	86,688.27
Primrose & Wolf Lake	78,578.60	84,239.40	83,772.70	82,196.90
Sunrise	44,067.00	46,663.50	46,982.40	45,904.30
Long Lake	44,518.00	44,448.80	44,018.60	44,328.47
Kirby South	34,995.20	34,186.40	36,816.10	35,332.57
Mackay River	17,050.40	33,323.40	35,510.40	28,628.07
Tucker	23,378.00	22,886.70	21,377.20	22,547.30
Leismer Demonstration	20,891.00	20,956.40	21,134.40	20,993.93
Lindbergh	14,622.60	14,361.50	14,393.60	14,459.23
Great Divide	13,169.00	13,579.70	13,201.10	13,316.60
Hangingstone	8,802.60	9,658.00	13,950.20	10,803.60
Hangingstone	9,502.00	9,513.30	9,680.00	9,565.10
Orion	8,796.30	9,945.40	9,197.60	9,313.10
Mackay River	8,347.20	8,812.70	9,573.10	8,911.00
Peace River/Carmon Creek	3,661.90	4,257.60	3,909.70	3,943.07
West Ells	2,091.40	2,665.60	2,307.10	2,354.70
Blackrod	495	477.4	469.2	480.53
Peace River	5	40.9	37.7	27.87
Pilot	27	17.5	...	22.25

CRUDE OIL PRICE DIFFERENTIAL (WTI-WCS)

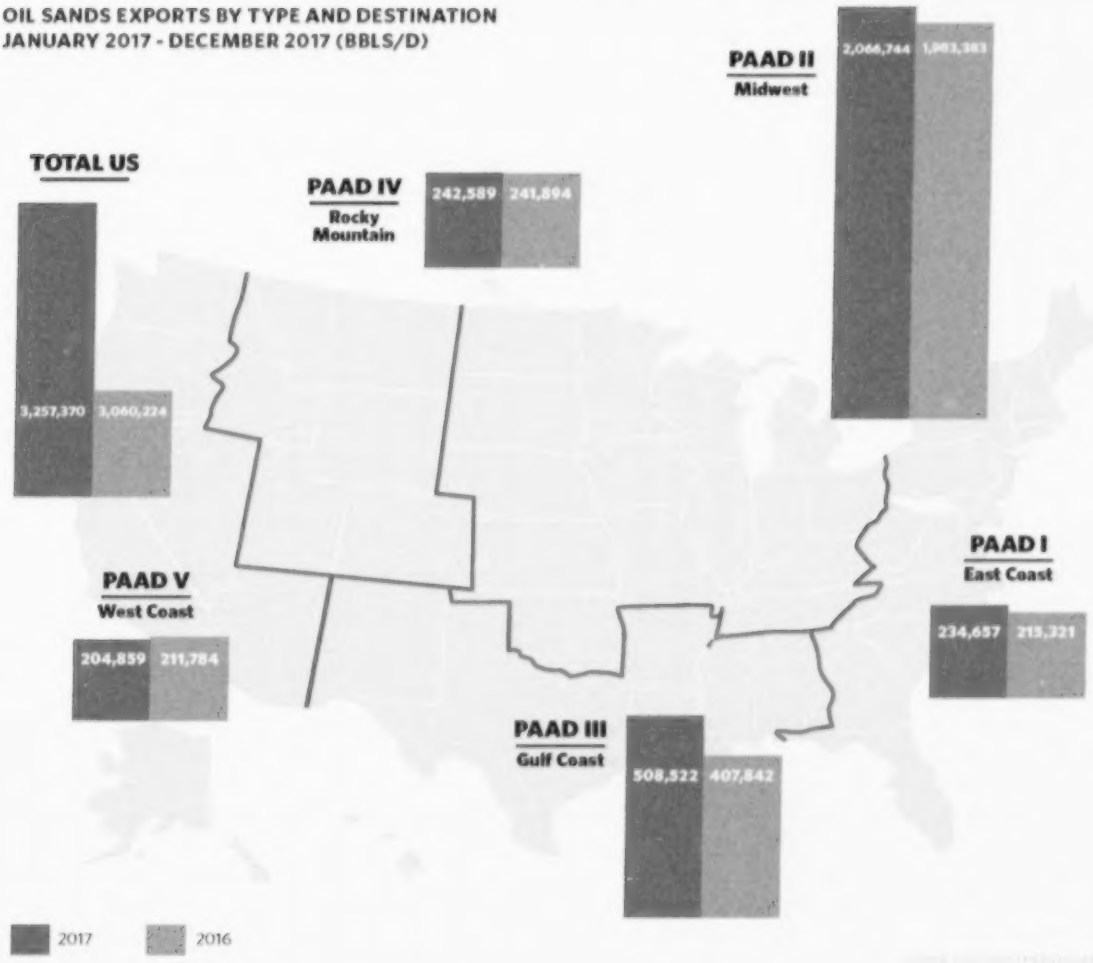
Recorded to Mar. 12, 2018



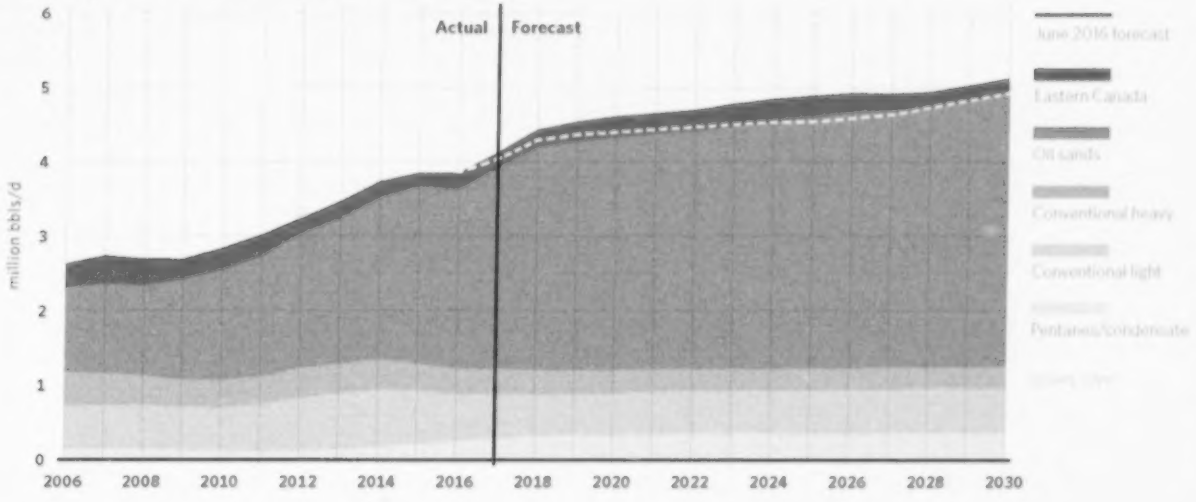
CANADIAN CRUDE OIL EXPORTS



OIL SANDS EXPORTS BY TYPE AND DESTINATION
JANUARY 2017 - DECEMBER 2017 (BBLS/D)



CANADIAN OIL SANDS & CONVENTIONAL PRODUCTION



GLOSSARY OF OIL SANDS TERMS

A

ASPHALTENES

The heaviest and most concentrated aromatic hydrocarbon fractions of bitumen.

B

BARREL

The traditional measurement for crude oil volumes. One barrel equals 42 U.S. gallons or 159 litres. There are 6.29 barrels in one cubic metre of oil.

BITUMEN

Naturally occurring, viscous mixture of hydrocarbons that contains high levels of sulphur and nitrogen compounds. In its natural state, it is not recoverable at a commercial rate through a well because it is too thick to flow. Bitumen typically makes up about 10 per cent by weight of oil sand, but saturation varies.

C

COGENERATION

The simultaneous production of electricity and steam, which is part of the operations of many oil sands projects.

COKING

An upgrading/refining process used to convert the heaviest fraction of bitumen into lighter hydrocarbons by rejecting carbon as coke. Coking can be either delayed coking (semi-batch) or fluid coking (continuous).

CONDENSATE

Mixture of extremely light hydrocarbons recoverable from gas reservoirs. Condensate is also referred to as a natural gas liquid and is used as a diluent to reduce bitumen viscosity for pipeline transportation.

CONVENTIONAL CRUDE OIL

Mixture of mainly pentane and heavier hydrocarbons recoverable at a well from an underground reservoir and liquid at atmospheric pressure and temperature. Unlike bitumen, it flows through a well without stimulation and through a pipeline without processing or dilution.

CRACKING

An upgrading/refining process for converting large, heavy molecules into smaller ones. Cracking processes include fluid cracking and hydrocracking.

CYCLIC STEAM STIMULATION (CSS)

An in situ production method incorporating cycles of steam injection, steam soaking and oil production. The steam reduces the viscosity of the bitumen and allows it to flow to the production well.

D

DENSITY

The heaviness of crude oil, indicating the proportion of large, carbon-rich molecules, generally measured in kilograms per cubic metre (kg/m^3) or degrees on the American Petroleum Institute (API) gravity scale. In western Canada, oil up to 900 kg/m^3 is considered light-to-medium crude; oil above this density is deemed as heavy oil or bitumen.

DILBIT

Bitumen that has been reduced in viscosity through the addition of a diluent such as condensate or naphtha.

DILUENT

A light hydrocarbon blended with bitumen to enable pipeline transport. See Condensate.

E

EXTRACTION

A process unique to the oil sands industry that separates the bitumen from the oil sand using hot water, steam and caustic soda.

F

FROTH TREATMENT

The means to recover bitumen from the mixture of water, bitumen and solids "froth" produced in hot-water extraction (in mining-based recovery).

G

GASIFICATION

A process to partially oxidize any hydrocarbon, typically heavy residues, to a mixture of hydrogen and carbon monoxide. Can be used to produce hydrogen and various energy by-products.

GROUNDWATER

Water accumulations below the Earth's surface that supply fresh water to wells and springs.

H

HEAVY CRUDE OIL

Oil with a gravity below 22 degrees API. Heavy crudes must be blended or mixed with condensate to be shippe by pipeline.

HYDROCRACKING

Refining process for reducing heavy hydrocarbons into lighter fractions using hydrogen and a catalyst; can also be used in upgrading bitumen.

HYDROTRANSPORT

A slurry process that transports water and oil sand through a pipeline to primary separation vessels located in an extraction plant.

HYDROTREATER

An upgrading/refining process unit that reduces sulphur and nitrogen levels in crude oil fractions by catalytic addition of hydrogen.

I

IN SITU

A Latin phrase meaning "in its original place." In situ recovery refers to various drilling-based methods used to recover deeply buried bitumen deposits.

IN SITU COMBUSTION

An enhanced oil recovery method that works by generating combustion gases (primarily CO and CO_2) downhole, which then push the oil toward the recovery well.

L

LEASE

A legal document from the province of Alberta giving an operator the right to extract bitumen from the oil sand existing within the specified lease area. The land must be reclaimed and returned to the Crown at the end of operations.

LIGHT CRUDE OIL

Liquid petroleum with a gravity of 28 degrees API or higher. A high-quality light crude oil might have a gravity of about 40 degrees API. Upgraded crude oils from the oil sands run around 30–33 degrees API (compared to 32–34 for Light Arab and 37–40 for West Texas Intermediate).

M

MATURE FINE TAILINGS

A gel-like material resulting from the processing of clay fines contained within the oil sands.

O

OIL SANDS

Bitumen-soaked sand deposits located in three geographic regions of Alberta: Athabasca, Cold Lake and Peace River. The Athabasca deposit is the largest, encompassing more than 42,340 square kilometres. Total in-place deposits of bitumen in Alberta are estimated at 1.7 trillion to 2.5 trillion barrels.

OVERBURDEN

A layer of sand, gravel and shale between the surface and the underlying oil sand in the mineable oil sands region that must be removed before oil sands can be mined.

P

PERMEABILITY

The capacity of a substance, such as rock, to transmit a fluid, such as crude oil, natural gas or water. The degree of permeability depends on the number, size and shape of the pores and/or fractures in the rock and their interconnections. It is measured by the time it takes a fluid of standard viscosity to move a given distance. The unit of permeability is the Darcy.

PETROLEUM COKE

Solid, black hydrocarbon that is left as a residue after the more valuable hydrocarbons have been removed from the bitumen by heating the bitumen to high temperatures.

PRIMARY PRODUCTION

An in situ recovery method that uses natural reservoir energy (such as gas drive, water drive and gravity drainage) to displace hydrocarbons from the reservoir into the wellbore and up to the surface. Primary production uses an artificial lift system in order to reduce the bottomhole pressure or increase the differential pressure to sustain hydrocarbon recovery, since reservoir pressure decreases with production.

R

RECLAMATION

Returning disturbed land to a stable, biologically productive state. Reclaimed property is returned to the province of Alberta at the end of operations.

S

STEAM ASSISTED GRAVITY DRAINAGE (SAGD)

An in situ production process using two closely spaced horizontal wells: one for steam injection and the other for production of the bitumen/water emulsion.

SURFACE MINING

Operations to recover oil sands by open-pit mining using trucks and shovels. Less than 20 per cent of Alberta's oil sands resources are located close enough to the surface (within 75 metres) for mining to be economic.

SYNTHETIC CRUDE OIL

A manufactured crude oil comprised of naphtha, distillate and gas oil-boiling range material. Can range from high-quality, light, sweet bottomless crude to heavy, sour blends.

T

TAILINGS

A combination of water, sand, silt and fine clay particles that is a byproduct of removing the bitumen from the oil sand through the extraction process.

TAILINGS SETTLING BASIN

The primary purpose of the tailings settling basin is to serve as a process vessel, allowing time for tailings water to clarify and silt and clay particles to settle so that the water can be reused in extraction. The settling basin also acts as a thickener, preparing mature fine tails for final reclamation.

THERMAL RECOVERY

Any in situ process where heat energy (generally steam) is used to reduce the viscosity of bitumen to facilitate recovery.

U

UPGRADING

The process of converting heavy oil or bitumen into synthetic crude either through the removal of carbon (coking) or the addition of hydrogen (hydroconversion).

V

VISCOSITY

The ability of a liquid to flow. The lower the viscosity, the more easily the liquid will flow.

OIL SANDS CONTACTS

OIL SANDS PRODUCERS

Athabasca Oil www.atha.com
Baytex Energy www.baytex.ab.ca
BlackPearl Resources www.blackpearlresources.ca
Brion Energy www.brionenergy.com
Canadian Natural Resources www.cnrl.com
Cenovus Energy www.cenovus.com
Chevron Canada www.chevron.ca
CNOOC www.cnoocltd.com
Connacher Oil and Gas www.connacheroil.com
ConocoPhillips Canada www.conocophillips.ca
Devon Canada www.dvn.com
Enerplus Resources Fund www.enerplus.com
E-T Energy www.e-tenergy.com
Grizzly Oil Sands www.grizzlyoilsands.com
Harvest Operations www.harvestenergy.ca
Husky Energy www.huskyenergy.ca
Imperial Oil www.imperialoil.ca
Japan Canada Oil Sands www.jacos.com
Koch Exploration Canada www.kochexploration.ca
Korea National Oil www.knoc.co.kr
Laricina Energy www.laricinaenergy.com
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North West Upgrading www.northwestupgrading.com
Nsolv www.nsolv.ca
Oak Point Energy www.oakpointenergy.ca
Occidental Petroleum www.oxy.com
Osum Oil Sands www.osumcorp.com
Pan Orient Energy www.panorient.ca
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PetroChina www.petrochina.com.cn/ptr
PTT Exploration and Production www.pttep.com
Sinopec www.sinopecgroup.com/group/en
Statoil Canada www.statoil.com
Suncor Energy www.suncor.com
Sunshine Oilsands www.sunshineoilsands.com
Syncrude www.syncrude.ca
Teck Resources www.teck.com
Total E&P Canada www.total-ep-canada.com
Touchstone Exploration www.touchstoneexploration.com
Value Creation Group www.vctek.com

ASSOCIATIONS/ORGANIZATIONS

Alberta Chamber of Resources www.acr-alberta.com
Alberta Chambers of Commerce www.abchamber.ca
Alberta Energy www.energy.gov.ab.ca
Alberta Energy Regulator www.aer.ca
Alberta Environment and Parks www.aep.alberta.ca
Alberta Innovates www.albertainnovates.ca
Alberta Innovation and Advanced Education www.eae.alberta.ca
Alberta's Industrial Heartland Association www.industrialheartland.com
Building Trades of Alberta www.bta.ca
Canada's Oil Sands Innovation Alliance www.cosia.ca
Canadian Association of Geophysical Contractors www.cagc.ca
Canadian Association of Petroleum Producers www.capp.ca
Canadian Heavy Oil Association www.choa.ab.ca
In Situ Oil Sands Alliance www.iosa.ca
Lakeland Industry & Community Association www.lica.ca
Natural Resources Conservation Board www.nrcb.ca
Oil Sands Community Alliance www.oscaalberta.ca
Oil Sands Secretariat www.energy.alberta.ca
Petroleum Technology Alliance Canada www.ptac.org

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